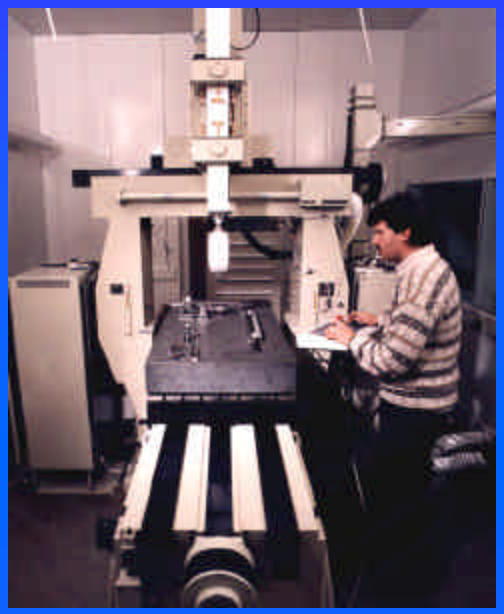
Engineering Metrology

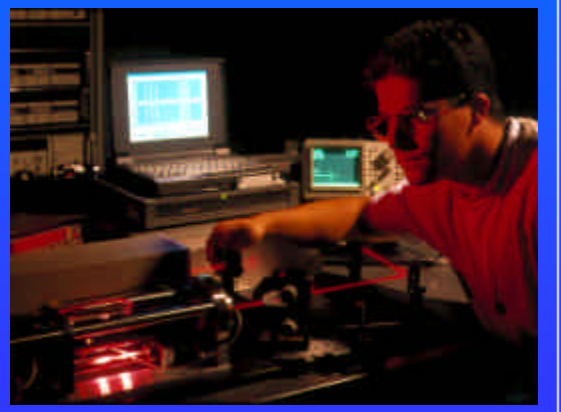
Goal

- Promote health & growth of U.S. discrete-parts manufacturing by: providing access to world-class engineering metrology resources; improving our services and widening the array of mechanisms for our customers to achieve high-accuracy dimensional measurements traceable to national and international standards



Deliverables

- State-of-the art measurement services with decreased turn-around time
- Improved measuring systems for API gages, angle measurement, and internal diameter, with decreased uncertainty for some measurements
- Gage block penetration study and design of associated SRM
- Worldwide mutual recognition of selected measurement services via Mutual Recognition Arrangement

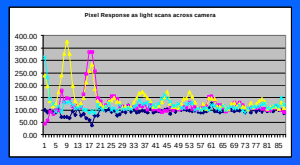


Customers and Collaborators

- Automotive, aerospace, heavy equipment, and telecommunication industries, among others

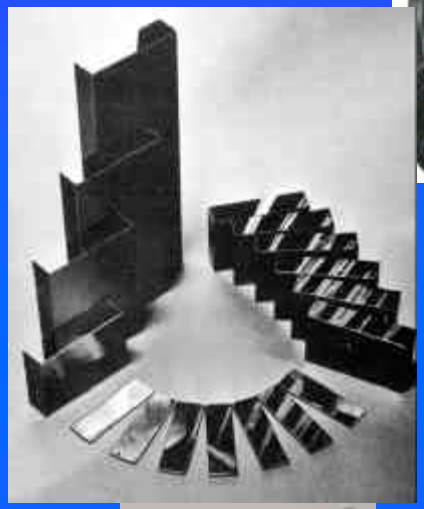
Provide direct traceability to national and international standards through calibration of more than 5000 artifacts each year.

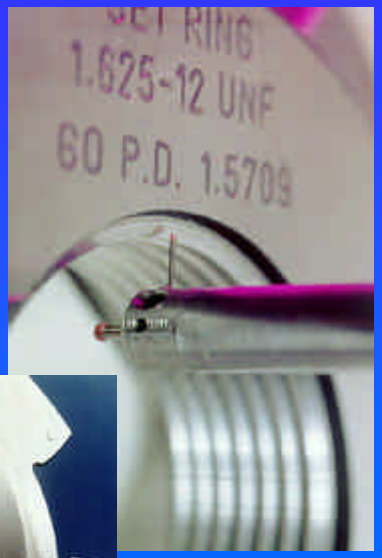
Extend range of current metrology instruments to meet emerging measurement demands, and characterize new systems that will provide foundation for the next-generation dimensional measurement

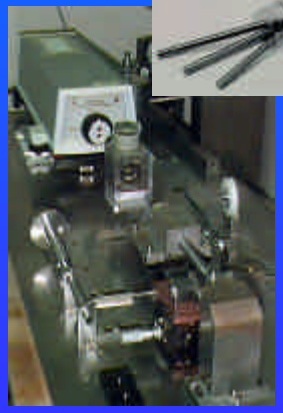


Provide alternative routes to traceability, through dissemination of knowledge, standards activities, and support of Mutual Recognition Arrangement.

Timely Provision of Calibration Services





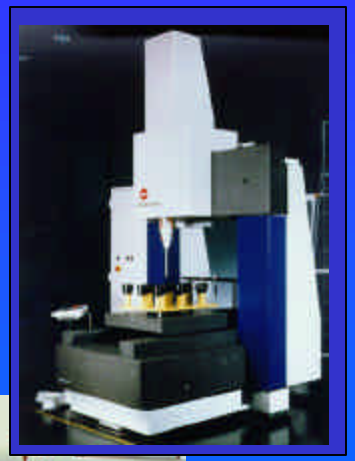


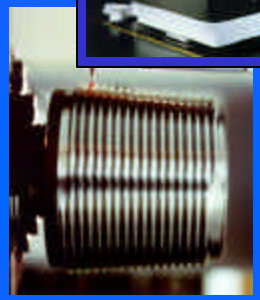
- We calibrate over 5000 artifacts each year, providing a traceable link to the definition of the meter for more than 160 organizations in 40 states.

- Turn-around time improved in FY200, and we expect that further improvements will occur this year.

Improving Calibration Services

- Measurements of API (American Petroleum Institute) threaded gages have been transferred to our Leitz* CMM (Coordinate Measuring Machine); we expect to see reduction in API measurement uncertainty





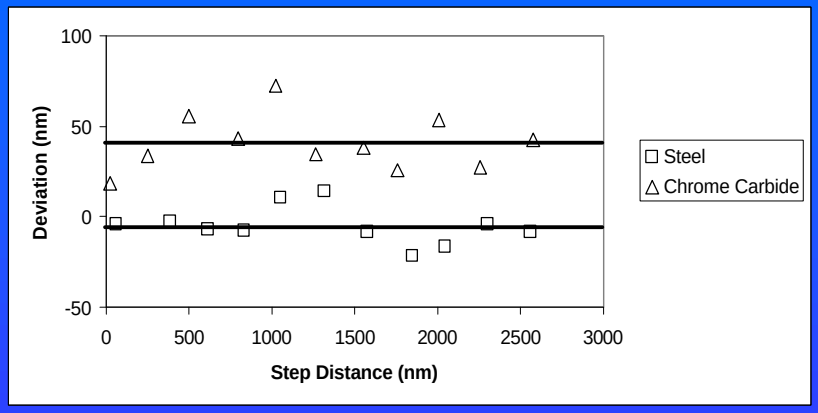
- Ring gage calibration on Moore* CMM has been characterized, provides streamlined calibrations with ~ 100 nm uncertainty.

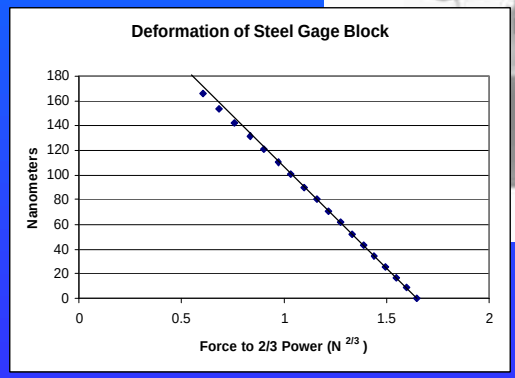
- Angle calibration will be automated on AAMACS

*** Identification of commercial products in this paper does not imply recommendation or endorsement by NIST.**

Extending Capabilities and Research into Calibration Methods

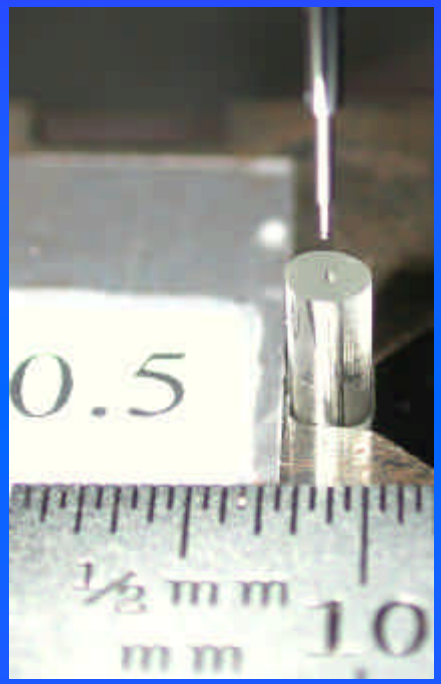
Deformation studies will improve efficiency of our gage block calibrations and are providing a detailed basis for understanding uncertainties of the probe/part interaction at the nanometer level. SRM will allow calibration laboratories in industry to improve operations.



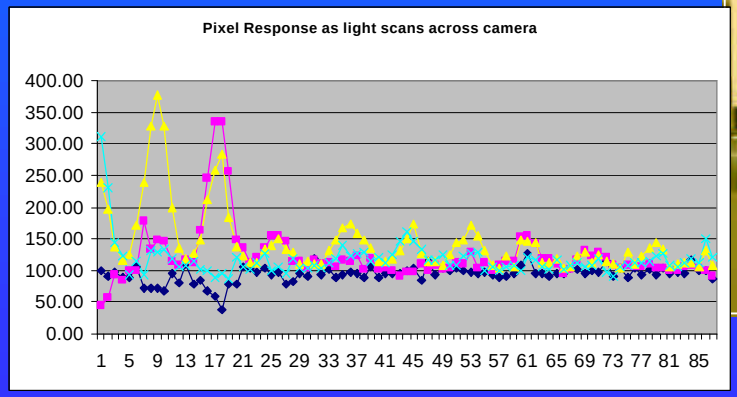


Extending Capabilities and Research into Calibration Methods *(contd)*

- Narrow holes with diameters as small as 500 µm have been measured: ~ 100 µm is needed.

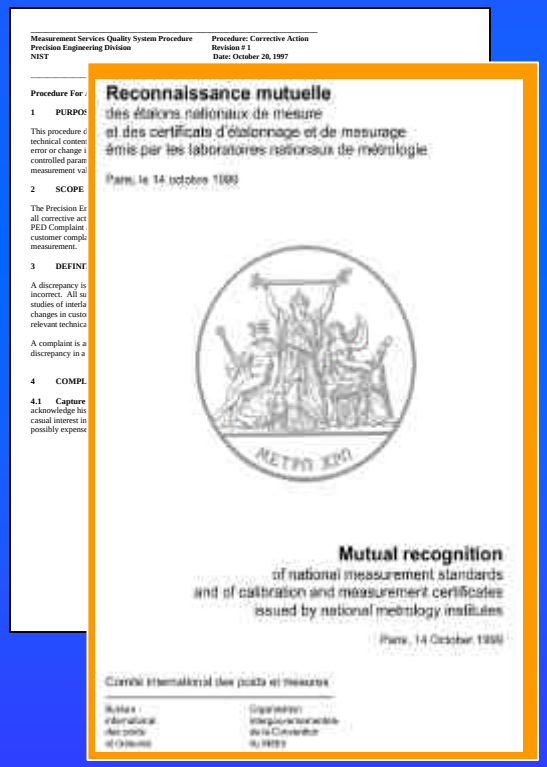


- First study of camera pixel imperfections paves the way toward more accurate video metrology.



International Confidence in Measurements

As part of effort to insure world-wide uniformity of measurements, we participate in CIPM key comparisons (such as ball plate measurement shown below). These comparisons provide technical basis for Mutual Recognition Arrangement (MRA), by which most of the major National Measurement Institutes worldwide agree to recognize each other's measurements. We are also updating our quality documentation in conjunction with this effort. It is expected that MRA will eliminate much duplication of efforts and reduce barriers to trade.



Standards Activities

International: Consultative Committee for Length (CCL) of the BIPM, SIM representative to Working Group for Dimensional Metrology (WGDM) of the CCL,TC213 WG.06

National: Numerous committee chairmanships, memberships, or serve as technical experts, including ASME committees on gage blocks, laser interferometer, optical CMM, roundness, gear metrology, Acme screw thread, internal and external diameter, measurement uncertainty, thread wire, vocabulary